

AD-A098 553

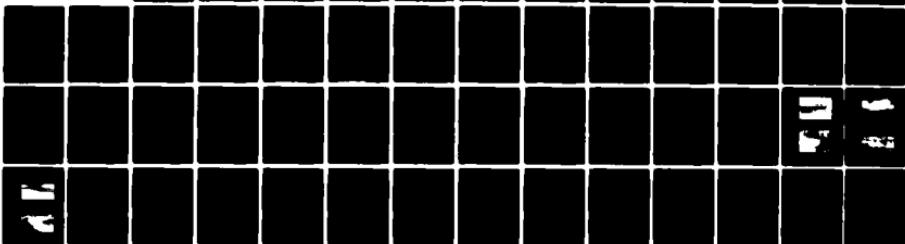
NEW JERSEY DEPT OF ENVIRONMENTAL PROTECTION TRENTON F/6 13/13
NATIONAL DAM SAFETY PROGRAM. J. SEWARD JOHNSON DAM (NJ00770), R--ETC(U)
MAR 81 A PEREA DACW61-79-C-0011

UNCLASSIFIED

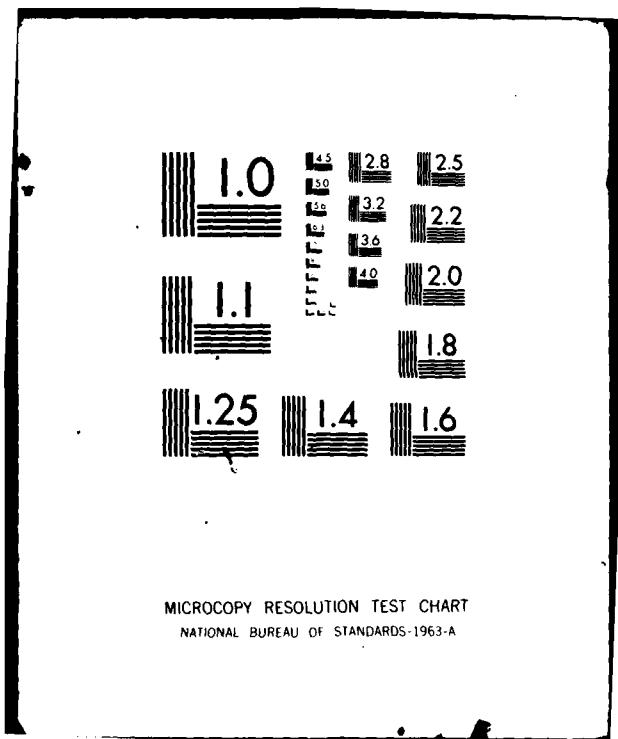
DAEN/NAP-53842/NJ00770-81/ NL

1 of 1
20 April 81

9



END
DATE FILMED
18-8-81
DTIC



AD A098553

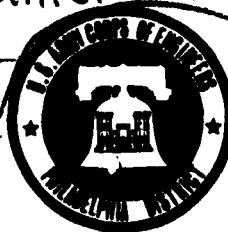
APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION UNLIMITED.

3 RARITAN RIVER BASIN,
COLD BROOK, HUNTERDON COUNTY,
NEW JERSEY.

0^{BS}

2 J. SEWARD JOHNSON
DAM LEVEL[#]
NJ 00770

6 PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM.
J. Seward Johnson Dam (NJ 00770). Raritan River
Basin, Cold Brook, Hunterdon County, New Jersey.
Phase I Inspection
Report.



DTIC
ELECTED
MAY 5 1981
S D

DTIC FILE COPY

9 Final report,
15 DACW61-79-C-0011

10 Abraham, Perez
A

DEPARTMENT OF THE ARMY

Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

22 53

DAEN/NAP

19 DAEN/NAP 53842/0500770-81/03

18

11 MAR 81

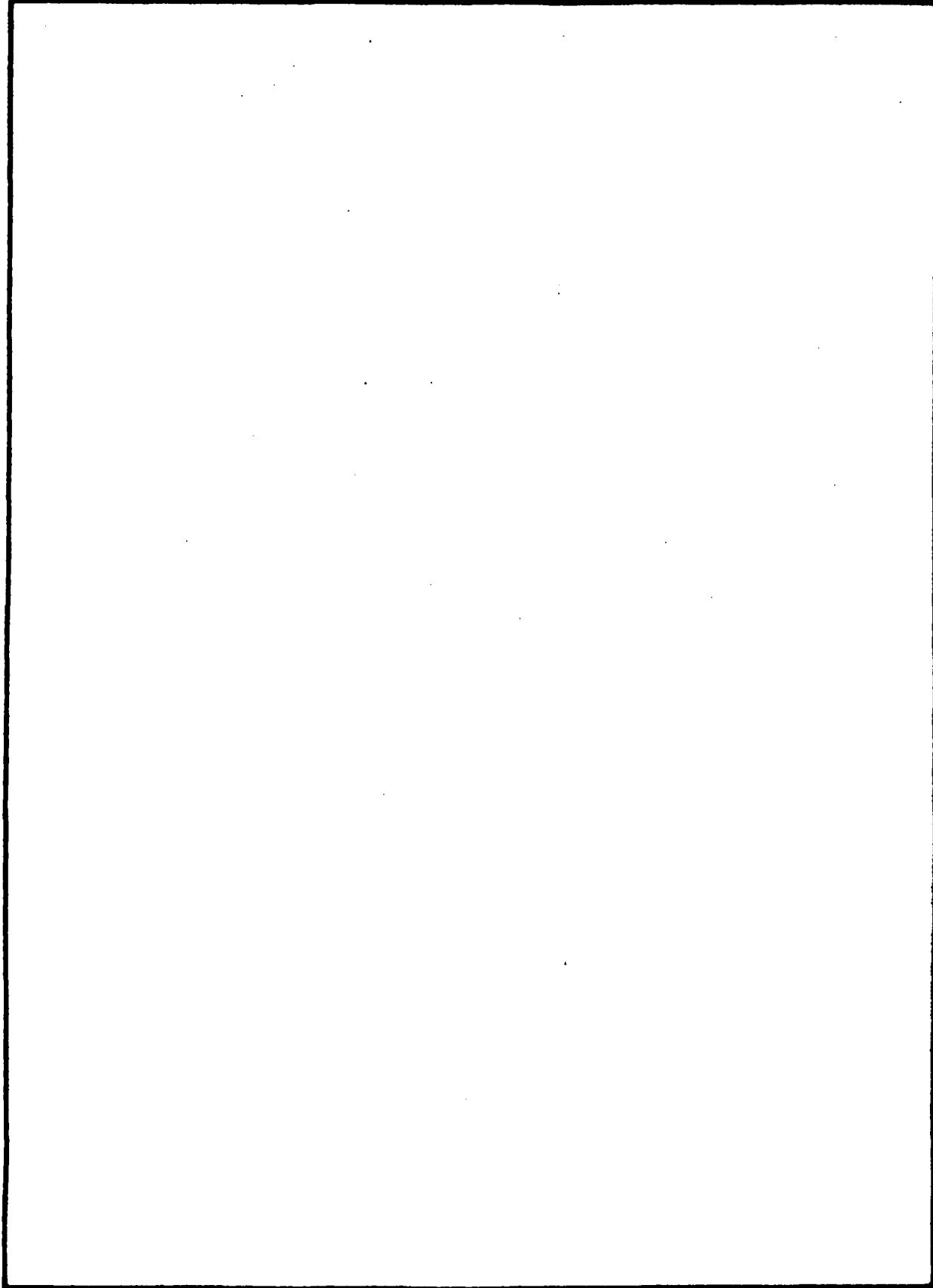
410891

81504091

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER DAEN/NAP-53842/NJ00770-81/03	2. GOVT ACCESSION NO. AD A098 533	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Phase I Inspection Report National Dam Safety Program J. Seward Johnson Da, Hunterdon County, NJ	5. TYPE OF REPORT & PERIOD COVERED FINAL	
7. AUTHOR(s) Abraham Perea, P.E.	6. PERFORMING ORG. REPORT NUMBER DACP61-79-C-0011	
9. PERFORMING ORGANIZATION NAME AND ADDRESS Louis Berger & Associates 100 Halstead St. East Orange, N.J. 07019	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
11. CONTROLLING OFFICE NAME AND ADDRESS NJ Department of Environmental Protection Division of Water Resources P.O. Box CN029 Trenton, NJ 08625	12. REPORT DATE March, 1981	
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) U.S. Army Engineer District, Philadelphia Custom House, 2d & Chestnut Streets Philadelphia, PA 19106	13. NUMBER OF PAGES 40	
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.	15. SECURITY CLASS. (of this report) Unclassified	
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)	18. DECLASSIFICATION/DOWNGRADING SCHEDULE	
18. SUPPLEMENTARY NOTES Copies are obtainable from National Technical Information Service, Springfield, Virginia 22151.	19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Dams Embankments Visual Inspection Structural Analysis National Dam Safety Program J. Seward Johnson Dam, N.J. Erosion Spillway	
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.		

~~SECURITY CLASSIFICATION OF THIS PAGE (If Other Than Dated Below)~~



~~SECURITY CLASSIFICATION OF THIS PAGE (If Other Than Dated Below)~~



DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE-2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-N

27 APR 1981

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for J. Seward Johnson Dam in Hunterdon County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, J. Seward Johnson Dam, initially listed as a high hazard potential structure but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in good overall condition and the spillway is considered adequate. To ensure the adequacy of the structure the following remedial actions are recommended:

a. The following actions should be completed within one year from the date of approval of this report:

(1) Clear the heavy brush from the embankment, upstream face of the dam, and the entrance to the auxiliary spillway approach channel, insuring that a durable grass cover is established in its place.

(2) Fill, grade, and reseed the eroded areas on the upstream face of the dam.

(3) Fill rodent burrows on the downstream slope of the embankment.

(4) The owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

(5) An emergency action plan should be developed which outlines actions to be taken by the owner to minimize the downstream effects of an emergency at the dam.

b. It is further recommended that employees continue to operate the blow-off valve periodically to ensure its workability and to keep the intake area free of excessive siltation and release additional water through the blow-off in anticipation of, or during, severe storms.

NAPEN-N

Honorable Brendan T. Byrne

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Courter of the Thirteenth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Inspection Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,



1 Incl
As stated

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

Copies furnished:

Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Accession For	
NTIS GRA&I <input checked="" type="checkbox"/>	
DNC TAB <input type="checkbox"/>	
Unannounced <input type="checkbox"/>	
Justification	
Re:	
Distribution/	
Availability Codes	
Dist	Avail and/or Special

J. SEWARD JOHNSON DAM (NJ00770)

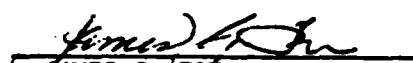
CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 28 August 1980 by Louis Berger and Associates, Inc. under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

J. Seward Johnson Dam, initially listed as a high hazard potential structure but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in good overall condition and the spillway is considered adequate. To ensure the adequacy of the structure the following remedial actions are recommended:

- a. The following actions should be completed within one year from the date of approval of this report:
 - (1) Clear the heavy brush from the embankment, upstream face of the dam, and the entrance to the auxiliary spillway approach channel, insuring that a durable grass cover is established in its place.
 - (2) Fill, grade, and reseed the eroded areas on the upstream face of the dam.
 - (3) Fill rodent burrows on the downstream slope of the embankment.
 - (4) The owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.
 - (5) An emergency action plan should be developed which outlines actions to be taken by the owner to minimize the downstream effects of an emergency at the dam.
- b. It is further recommended that employees continue to operate the blow-off valve periodically to ensure its workability and to keep the intake area free of excessive siltation and release additional water through the blow-off in anticipation of, or during, severe storms.

APPROVED:



JAMES G. TON

Colonel, Corps of Engineers
District Engineer

DATE:

5 April 1981

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam J. Seward Johnson Dam Fed ID# NJ 00770
NJ ID# 577

State Located New Jersey
County Located Hunterdon
Coordinates Lat. 4041.3 - Long. 7445.8
Stream Cold Brook
Date of Inspection August 28, 1980

ASSESSMENT OF
GENERAL CONDITIONS

J. Seward Johnson Dam is in a good overall condition and has an adequate spillway capacity to accommodate the 100-year design flood. It is recommended that its hazard classification be downgraded to significant because its overtopping or collapse could damage farm property immediately downstream. No detrimental findings were uncovered to merit further study. Recommended remedial actions to be taken in the future include repair and seeding of the eroded areas and rodent burrows on the embankment, and the removal of excessive vegetation. It is further recommended that the owner develop written operating procedures, a periodic maintenance plan, and an emergency action and alert plan.



Abraham Perera P.E.
Project Manager



OVERVIEW OF J. SEWARD JOHNSON DAM
AUGUST, 1980

TABLE OF CONTENTS

	<u>Page</u>
Assessment of General Conditions	
Overall View of Dam	
Table of Contents	
Preface	
Section 1 - Project Information	1-4
Section 2 - Engineering Data	5-6
Section 3 - Visual Inspection	7-8
Section 4 - Operational Procedures	9
Section 5 - Hydraulic/Hydrologic	10
Section 6 - Structural Stability	11-12
Section 7 - Assessments/Recommendations/ Remedial Actions	13-14

FIGURES

- Figure 1 - Regional Vicinity Map
- Figure 2 - Plan of Dam
- Figure 3 - Spillway and Dam Sections

APPENDIX

Check List - Visual Inspection	i-xi
Check List - Engineering Data	
Photographs	
Check List - Hydrologic and Hydraulic Data	
Computations	A1-A12

APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION UNLIMITED.

DAEN(NAP - 53842/NJ 00770 - 81/03

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
NAME OF DAM: J. SEWARD JOHNSON DAM FED #NJ 00770
AND NJ ID # 577

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

This report is authorized by the Dam Inspection Act, Public Law 92-367, and has been prepared in accordance with Contract FPM-36 between Louis Berger & Associates, Inc. and the State of New Jersey and its Department of Environmental Protection, Division of Water Resources. The State, in turn, is under agreement with the U.S. Army Engineer District, Philadelphia to have this inspection performed.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the structural and hydraulic condition of the J. Seward Johnson Dam and appurtenant structures, and to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

J. Seward Johnson Dam is an 1,150-foot-long crescent-shaped, earthen structure with a 2-foot-thick impervious soil blanket upstream. The embankment has a maximum height of 24 feet, a crest width of 15 feet and 3H:1V/4H:1V slopes upstream and downstream, respectively. The principal discharge outlet consists of a drop inlet structure containing a two-stage concrete riser with an anti-vortex slab, a low-level gate-controlled 15-inch-diameter inlet, and a 66-inch diameter CMP outlet. A 30-foot-wide trapezoidal-shaped auxiliary spillway with a negatively sloped approach channel is located at the right abutment. In addition, an 8-inch-diameter, asphalt-cement irrigation pipe extends from the bottom of the pond through the dam to a cluster of barns where it connects with the existing irrigation system. A 3-inch-diameter sustained flow pipe extends from the upstream side of the

pond to the intake for the principal outlet. All pipes that pass through the dam have anti-seep collars and a stone drain is located beneath the downstream toe of the dam.

b. Location

The dam is located on Cold Brook in Tewksbury Township, Hunterdon County and is approximately one mile north of Oldwick. It is approximately 400 feet northeast of County Rte. 517.

c. Size Classification

The dam at Johnson Pond has a maximum height of 24 feet and a maximum storage capacity of 75 acre-feet. Accordingly, this dam is in the small size category as defined by the criteria in the Recommended Guidelines for Safety Inspection of Dams (storage less than 1,000 acre-feet and height less than 40 feet).

d. Hazard Classification

This dam is located in a gently rolling agricultural region of the county. The area immediately below the dam is very broad and flat with no clearly defined channel valley. The only downstream hazard is a farm house and three barns located 400-500 feet below the dam. All of these structures could receive substantial damage in the event of a dam failure; accordingly, it is recommended that this dam be downgraded to a significant hazard category.

e. Ownership

This dam is owned by Mr. James Johnson, Vliettown Road, Oldwick, New Jersey 08858, (201) 439-3130.

f. Purpose of Dam

The purpose of the dam is irrigation.

g. Design and Construction History

The dam was designed in 1965 by the SCS. Construction was completed in 1966, but leakage through the joints of the CMP outlet required

grouting, which was performed by PreAkt Concrete Company in 1967.

h. Normal Operating Procedures

The dam is maintained by personnel employed at the Johnson Farm. Water is drawn off as required for irrigation or other agricultural purposes.

1.3 PERTINENT DATA

a. Drainage Area

J. Seward Johnson Dam has a drainage area of 0.64 square miles, which consists of woodland, cropland, and meadowland.

b. Total spillway capacity at maximum pool elevation - 1,255 cfs

c. Elevations (assumed datum)

Top of dam	- 104.0
Principal spillway crest	- 99.0
Auxiliary spillway crest	- 102.2
Streambed at centerline of dam	- 80.0

d. Reservoir

Length of maximum pool (top of dam) - 650 feet

Length of normal pool (principal spillway crest) - 600 feet

Length of flood control pool (auxiliary spillway crest) - 625 feet

e. Storage (acre-feet)

Top of dam - 74 acre feet

Recreation pool - 50 acre feet

Flood control pool - 63 acre feet

f. Reservoir Surface (acres)

Top of dam - 5.5

Recreation pool - 4.0

Flood control pool - 4.9

g. Dam

Type - Earth with drop inlet and auxiliary spillway

Length - 1,150 feet

Height - 24 feet

Top width - 15 feet

Side Slopes - 3H:1V and 4H:1V

Zoning - Unzoned

Impervious blanket - Two-foot-thick blanket composed of silt and silty sand (ML-SM) compacted to 95% of maximum dry density

Cutoff - None

Grout curtain - None

h. Diversion and Regulating Tunnel

Type - None

i. Spillway

Type - Auxiliary channel excavated at right abutment

Channel width - 30 feet

Gates - None

U/S Channel - Negatively sloped, vegetated inlet

D/S Channel - Positively sloped, vegetated outlet

j. Regulating Outlets

The primary outlet is a two-stage, drop inlet structure with a 66-inch-diameter corrugated metal outlet pipe. The principal inlet spillway crest is at elevation 102.2, and the low level inlet invert is at elevation 81.5.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Details of the initial design, hydraulic determinations, structural analyses, and subsurface information were available for review by the inspection team together with as-built plans and the various corrective measures undertaken since the initial construction. All design was done in accordance with SCS criteria. The main spillway drop inlet structure is a two-stage, deep-well concrete riser of a standard design developed by the Saint Anthony Falls Hydraulic Laboratory.

2.2 CONSTRUCTION

The construction closely followed the design plans except in the area of the auxiliary spillway. As-built drawings and field reconnaissance indicates that the exit channel of the auxiliary spillway was constructed in a straight alignment below the control section rather than curved around the dam's toe as depicted on the original plans. Grouting of the principal outlet was required following construction to mitigate seepage conditions at the joints. According to their investigations, the Soil Conservation Service has determined that the dam is constructed on impervious glacial till overlying weathered Triassic shale. The depth of the till ranges from about 5 feet near the center of the dam to 12 feet or more at the abutments.

2.3 OPERATIONS

General information pertaining to operations at the dam was obtained from the owner and employees near the site at the time of the inspection. There are no formal records of day-to-day operational procedures nor are they particularly germane to this inspection since they pertain primarily to irrigation and/or farming activities rather than water regulation within the pond.

2.4 EVALUATION

a. Availability

Sufficient engineering data were available to evaluate the stability and hydraulic capacity of the dam.

b. Adequacy

The field inspection and review of the available design plans reveal that the dam is structurally sound and well-built. It is believed that the data available are adequate to render this assessment without recourse to gathering additional information.

c. Validity

An arithmetic error was noted in the SCS discharge rating curve; therefore, a new spillway rating curve was developed and used in the hydraulic/hydrologic determinations.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspection of J. Seward Johnson Dam took place on August 28, 1980. The dam appeared to be in a generally satisfactory condition with the water level at normal pool elevation at the time of inspection.

b. Dam

The embankment is a crescent-shaped structure (see Figure 2) constructed on a gentle and uniformly sloping hillside. Matted grass on the crest indicates the presence of an occasional vehicle, although severe rutting was not observed. Heavy brush and an occasional young conifer were noted in scattered areas on the left half of the downstream embankment, while somewhat thinner growth covered the upstream face of the dam. The alignment of the crest is satisfactory. No slumping, cracking, or seepage was observed although some rodent burrows were noted on the downstream slope and light erosion was evident at several locations on the upstream face.

c. Appurtenant Structures

The principal spillway riser and outfall are located roughly at the center of the dam. The upper portion of the reinforced concrete anti-vortex slab and the outfall headwall are in good condition. The bar rack around the drop inlet was clear of debris and the stem and gate wheel appeared in good working order. The auxiliary spillway has a level, 30-foot-long control section about 2 feet lower than the crest elevation of the dam. Both the entrance and exit channels are covered with a thick growth of grass. However, the approach to the entrance channel is overgrown and somewhat obstructed with heavy brush along the edge of the pond.

d. Reservoir Area

The drainage area of this man-made impoundment is only sparsely inhabited and consists primarily of woodland and farms. The area immediately surrounding the lake is wooded with moderate slopes

and has a generally clean and natural appearance with no debris or obstructions noted.

e. Downstream Channel

The area immediately downstream of the dam is a relatively broad, gentle slope with a narrow channel incised 3-4 feet deep. The stoney bottomed channel extends straight from the principal outlet through a concrete 2.5 foot x 7 foot culvert under a secondary farm road about 400 feet downstream from the toe of the dam. On the downstream side of the road the flood plain becomes broader and more gentle in slope until the channel reaches the main stem of Cold Brook about 3,000 feet downstream. With the exception of one farmhouse 500 feet downstream, the flood plain is uninhabited.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

J. Seward Johnson Dam was constructed and is utilized solely for irrigation and other agricultural purposes. There are no formalized operational procedures in effect at the dam although, in the normal course of agricultural activities at the site, the various pipes are utilized frequently. Moreover, the gate valve at the base of the riser was opened this spring to check its workability as well as to clean the intake area of sediment buildup.

4.2 MAINTENANCE OF DAM

Maintenance of the dam is provided by farm employees and consists primarily of general caretaking although more extensive maintenance work is within their capabilities should the need arise. Except for the need for additional brush removal, the embankment appears in a satisfactory state of repair.

4.3 MAINTENANCE OF OPERATING FACILITIES

Maintenance of the operational components are performed as required by farm employees and, because this facility is utilized throughout the year, the operating elements are continuously maintained in good functional order.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

There is no formal warning system in effect at this dam nor is there a formalized plan for contacting civil defense or other authorities in the event of an emergency. However, farm workers are employed in or about the vicinity of the dam and monitor conditions at the dam in conjunction with their other duties.

4.5 EVALUATION OF OPERATIONAL ADEQUACY

In view of the small drainage area, conservative hydraulic design, and satisfactory condition of this dam, the present operational procedures are considered adequate although more attention to brush removal is required at this time.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data

Pursuant to the Recommended Guidelines for Safety Inspection of Dams, J. Seward Johnson Dam is of small size and significant hazard. Accordingly, the 100-year frequency storm was chosen as the design flood by the inspecting engineers. Inflow to the reservoir for the selected 100-year storm was computed utilizing precipitation data from Technical Publication 40 and Technical Memo NWS Hydro 35 by the HEC-1 computer program, which gave a peak inflow of 1,284 cfs. Routing this storm through the reservoir slightly reduced the peak discharge to 1,221 cfs. As the combined spillway capacities are 1,255 cfs, they can accommodate the 100-year flood.

b. Experience Data

The spillway capacity was designed to accommodate 122% of a 50-year storm (based on North and Central Jersey curves) with 1.425 feet of free-board. According to the owner, the dam has never been overtopped.

c. Visual Observation

The spillway appears to accommodate all normal flows, and during periods of heavy storms, the relatively large auxiliary spillway effectively controls the lake level.

d. Overtopping Potential

Employing the discharge and spillway capacities contained herein, no overtopping would occur during a 100-year frequency storm. There are no records or indications that the dam has ever been overtopped nor does there appear to be a significant potential for serious damage as a result of overtopping.

e. Drawdown

The 12 inch x 12 inch sluice gate in the main riser can be opened to dewater the lake. Drawdown is possible to elevation 81.5 and would take approximately 2.7 days to accomplish.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

No deficiencies of a structural nature were noted during the inspection of this dam. The horizontal alignment of the dam crest is good and both upstream and downstream slopes are uniform and at true design grade. No indication of material movement (such as settling, sloughing, or creep) was observed and the spatial relationship of the auxiliary spillway cut and the dam crest is as indicated on the revised design plans. Water was entering the drop inlet uniformly from all four sides, indicating the symmetry and continuing stability of that structure.

b. Design and Construction Data

A review of the SCS design data, including hydraulic analysis, material selections, and contract plans for the initial construction, indicates the design is well-engineered, reflecting a conservative approach and employing contemporary analytical techniques. Based on the present condition of the dam and a history of uninterrupted satisfactory performance since its construction, it is believed that additional studies or investigations relative to the stability of this structure are unnecessary at this time.

c. Operating Records

The performance of this structure has been satisfactory since its completion. However, there are no formal operating records available.

d. Post Construction Changes

There has been one modification of note since the construction of this dam was completed. When the lake was being filled following construction, water was observed leaking through the joints of the outlet CMP. To correct this condition the joints of the CMP were sealed with chemical grout and the embankment around the outlet structure was treated with 1,000 cubic feet of intrusion cement-based grout. This procedure not only

sealed off all leaks but enhanced the embankment stability in the area surrounding the outfall structure.

e. Seismic Stability

J. Seward Johnson Dam is located in Seismic Zone 1 in which seismic activity is slight and additional structural loading imparted thereby is generally insignificant. Experience indicates that earthen dams in Zone 1 that are stable under static loading conditions will maintain their structural integrity when subjected to the negligible dynamic loads imposed by the weak seismicity characteristic of this area.

SECTION 7 - ASSESSMENTS/RECOMMENDATIONS/ REMEDIAL ACTIONS

7.1 DAM ASSESSMENT

a. Safety

Subject to the inherent limitations of the Phase I visual inspection, J. Seward Johnson Dam is judged to be in a good to excellent overall structural condition. The combined spillway capacities are adequate to accommodate the 100-year frequency design flood so overtopping is a very remote possibility. The dam is recommended to be placed in the significant hazard category solely on the basis of a farm house and barns 400 to 500 feet downstream of the dam.

b. Adequacy of Information

The SCS design information made available by the NJDEP is deemed to be adequate regarding the analyses and evaluation of safe operation and structural stability.

c. Urgency

The remedial measures described below should be undertaken sometime in the future.

d. Necessity for Further Study

In view of the overall condition of this dam and the fact that it is continually monitored and maintained by employees of the owner, additional inspections under the purview of P.L. 92-367 are deemed to be unnecessary.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

a. Recommendations

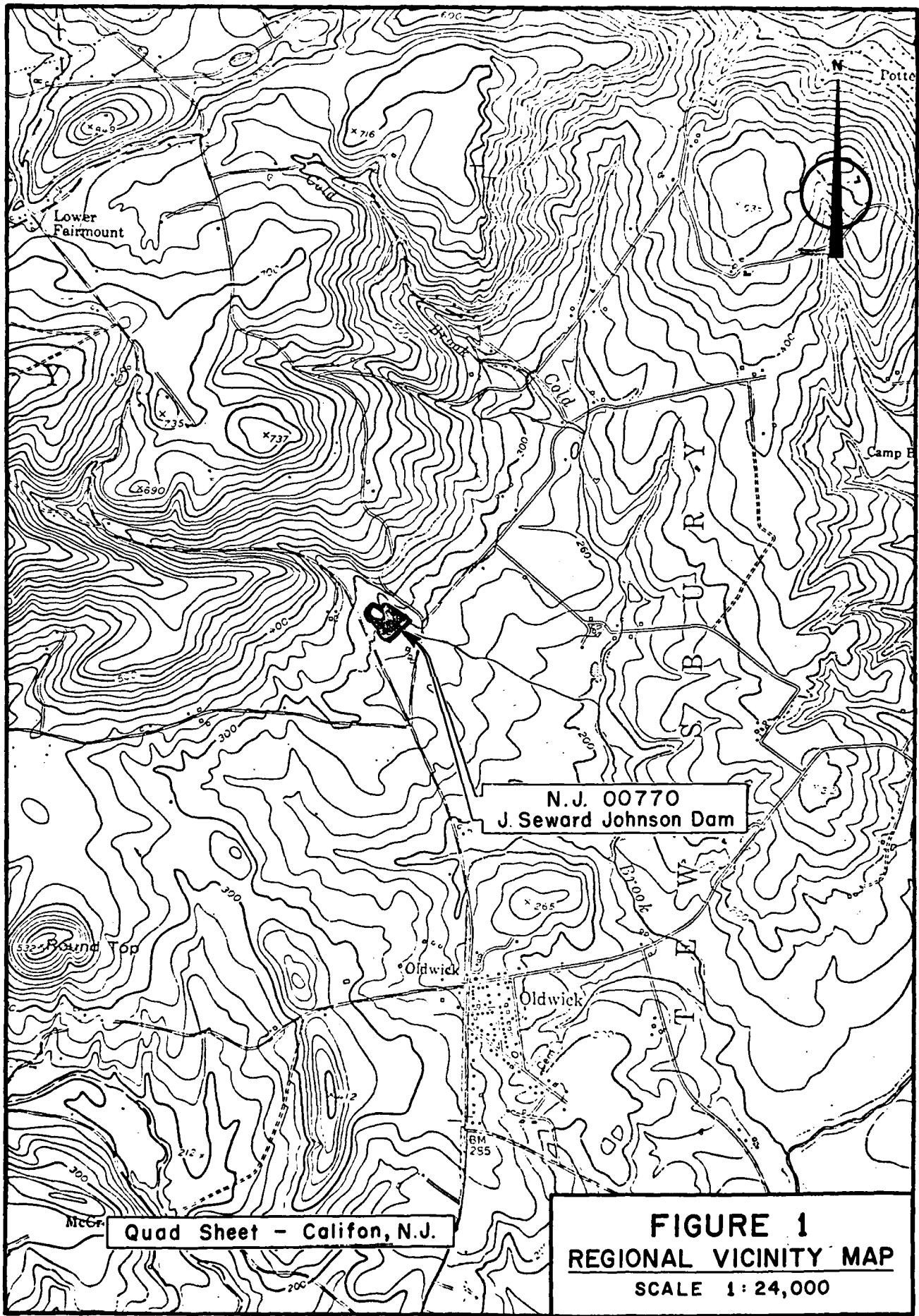
Under the present maintenance program, it is recommended that the following be performed in the future:

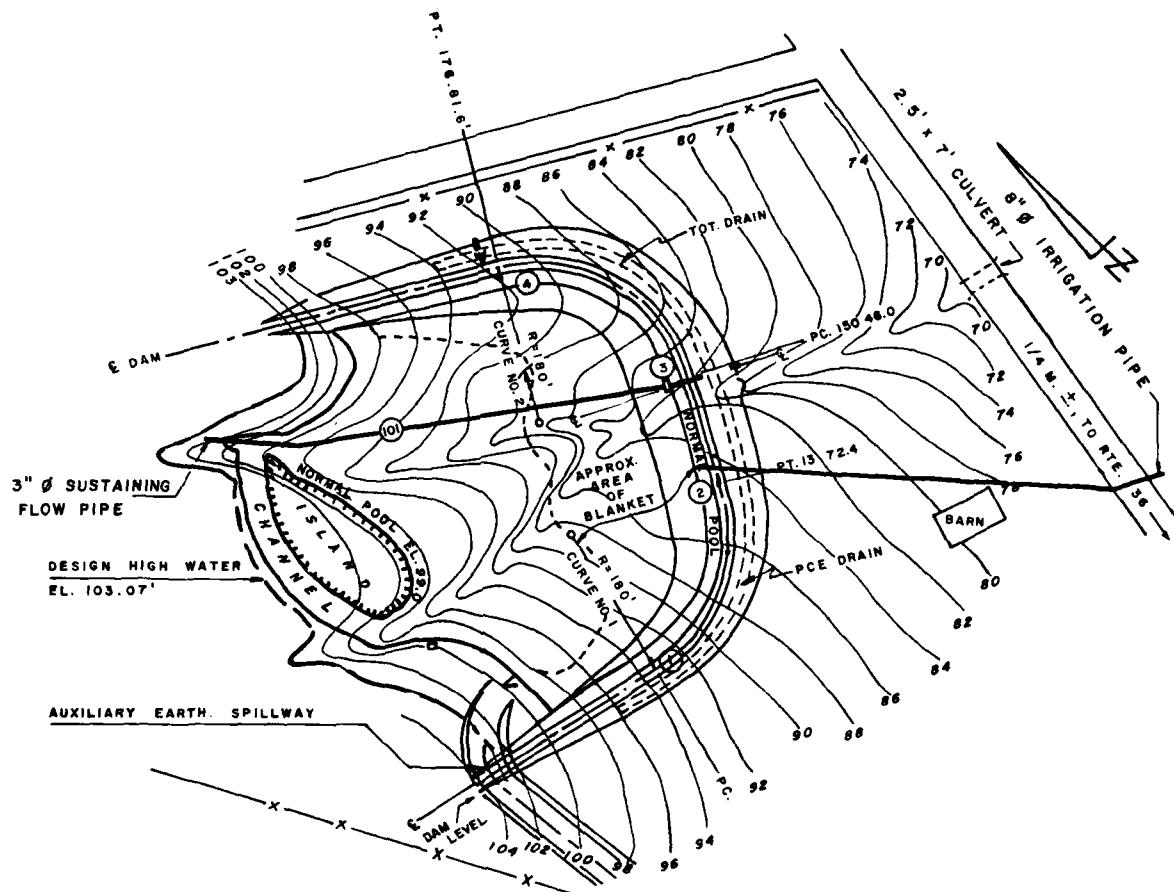
- o Clear the heavy brush from the embankment, upstream face of the dam, and the entrance to the auxiliary spillway approach channel insuring that a durable grass cover is established in its place.

- o Fill, grade, and reseed the eroded areas on the upstream face of the dam.
- o Fill rodent burrows on the downstream slope of the embankment.

B. O&M Maintenance and Procedures

In view of the assessment contained herein, no additional procedures other than those presently in effect appear to be required. However, it is recommended that the owner develop (1) written operating procedures and a periodic maintenance plan to ensure the continuing integrity of the dam and (2) an emergency action plan and downstream warning system to minimize the hazard potential of this dam. It is further recommended that employees (1) continue to operate the blow-off valve periodically to ensure its workability and to keep the intake area free of excessive siltation and (2) release additional water through the blow-off in anticipation of, or during, severe storms.



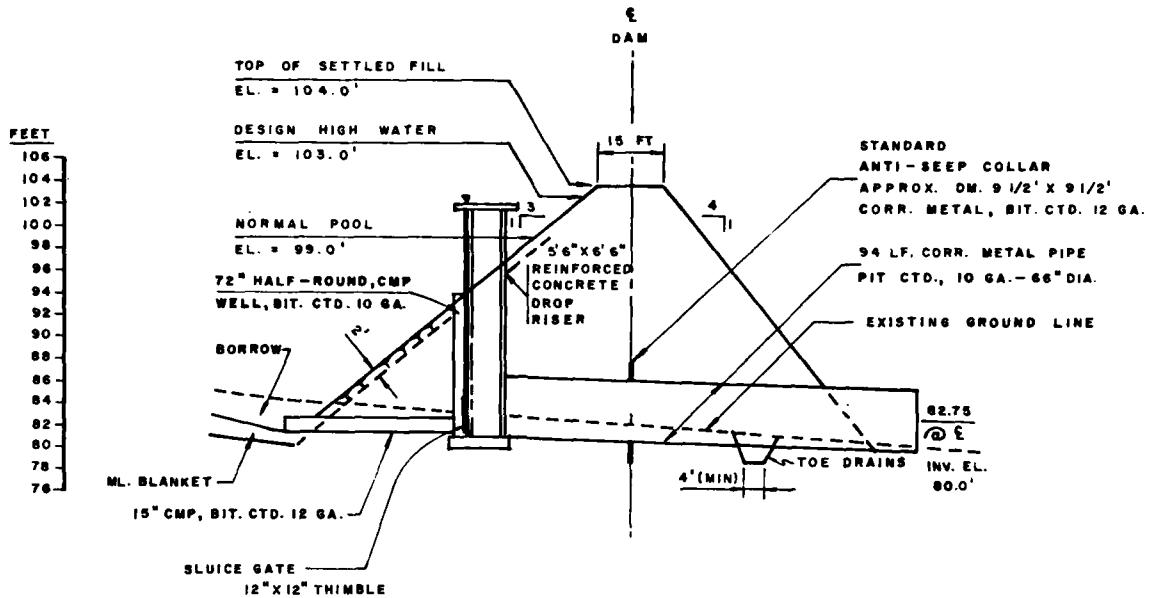


PLAN OF DAM AND POND

NOT TO SCALE

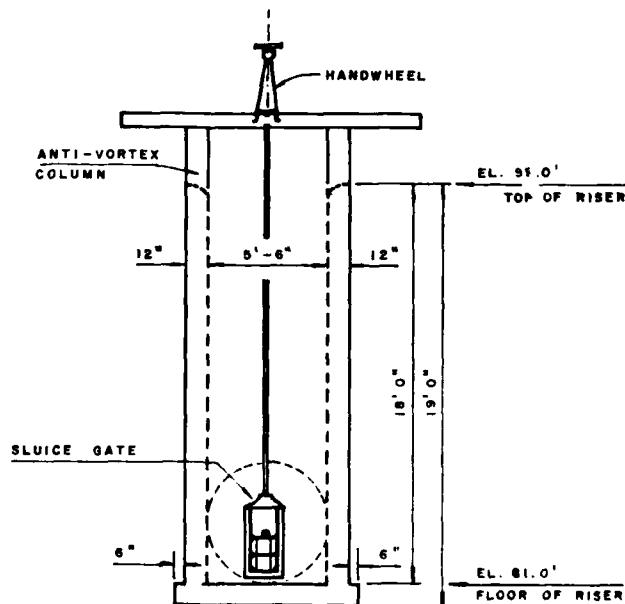
J. SEWARD JOHNSON DAM

FIGURE 2



SECTION THRU E OF SPILLWAY AND DAM

NOT TO SCALE



SECTION THRU RISER

NOT TO SCALE

J. SEWARD JOHNSON DAM

FIGURE 3

Check List
Visual Inspection
Phase 1

Name Dam J. Seward Johnson Dam

County Hunterdon

State New Jersey

Coordinators NJDEP

Date(s) Inspection 8/28/80

Weather Clear

Temperature 80°

Pool Elevation at Time of Inspection 99 A.D. *

Tailwater at Time of Inspection 80 A.D. *

Inspection Personnel:

A. Perera

J. Greenstein

R. Lang

T. Chapter

T. Chapter

T. Chapter Recorder

*Assumed Datum

EMBANKMENT

VISUAL EXAMINATION OF		OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS		None Observed	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE		None Observed	
SLoughing OR Erosion OF ENBANKMENT AND ABUTMENT SLOPES		Light erosion on upstream face, particularly near drop inlet. Several small animal burrows on downstream face.	Probably result of foot traffic. Eroded areas and burrows should be filled.
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST		Satisfactory - No settlement or movement observed.	
RIPRAP FAILURES		N/A	ii

EMBANKMENT

VISUAL EXAMINATION OF VEGETATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
	Some trees and heavy brush on upstream and left half of downstream slopes.	Brush should be cut. Pine trees at the toe are of no consequence and can be left in place.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Satisfactory - Embankment grades smoothly into surrounding terrain.	
ANY NOTICEABLE SEEPAGE	Not Observed	
STAFF GAGE AND RECORDER	None Observed	
DRAINS	Plans indicate a 2.5' x 4' drain located under the downstream toe.	Drain exit not observed. iii.

VISUAL EXAMINATION OF	OUTLET WORKS	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT		None Observed	
INTAKE STRUCTURE		Light efflorescence noted on deck slab. No debris around intake to drop inlet.	Drop inlet structure in good condition.
OUTLET STRUCTURE			Some surface weathering of headwall. Completely overgrown with vines.
OUTLET CHANNEL			Small rocky-bottomed stream with lush vegetation along both banks.
EMERGENCY GATE			Gate is reported operable by owner. Appears in good condition.

UNGATED SPILLWAY		
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	No concrete. Level section is grass. tall.	Well landscaped. Grass is 6-8 inches
APPROACH CHANNEL		Schrubs and brush should be cleared from channel at the lake's edge.
DISCHARGE CHANNEL		Satisfactory condition.
BRIDGE AND PIERS	None	

VISUAL EXAMINATION OF		RESERVOIR	REMARKS OR RECOMMENDATIONS
OBSERVATIONS			
SLOPES	Reservoir on side of uniformly sloping hill, well wooded and uninhabited upslope.		
SEDIMENTATION	Heavy silty flow reported by owner when low level drain valve was opened last year. Sedimentation rate does not appear excessive based on frequency of flushing.		

DOWNSTREAM CHANNEL		REMARKS OR RECOMMENDATIONS
VISUAL EXAMINATION OF	OBSERVATIONS	
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Channel is unobstructed with possible exception of 2.5' x 7' road culvert several hundred feet downstream.	Flood wave would disburse over wide area and dissipate rapidly.
SLOPES	Entire downstream area adjoining stream channel is relatively flat.	
APPROXIMATE NO. OF HOMES AND POPULATION	1 farm house about 600 feet downstream. Four inhabitants at this house.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

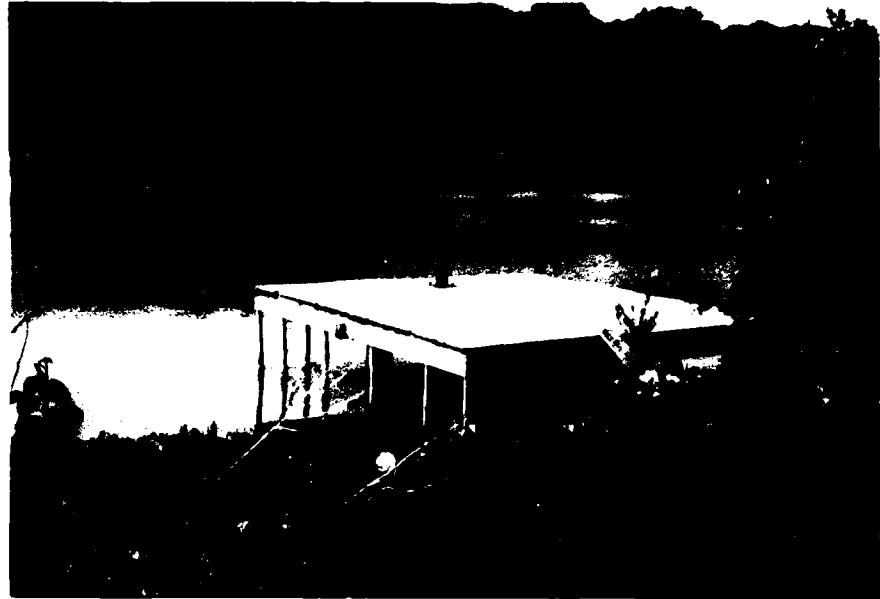
<u>ITEM</u>	<u>REMARKS</u>
PLAN OF DAM	Available from SCS (1370 Hamilton Street, Somerset, N.J.)
REGIONAL VICINITY MAP	Available from SCS or USGS Quad.
CONSTRUCTION HISTORY	Available from SCS
TYPICAL SECTIONS OF DAM	Available from SCS
HYDROLOGIC/HYDRAULIC DATA	Available from SCS
OUTLETS - PLAN	Available from SCS
- DETAILS	Available from SCS
- CONSTRAINTS	Available from SCS
- DISCHARGE RATINGS	Available from SCS
RAINFALL/RESERVOIR RECORDS	None kept

ITEM	REMARKS
DESIGN REPORTS	Available from SCS
GEOLOGY REPORTS	Available from SCS, State Geologic Map and Rutgers Engineering Soil Survey of New Jersey
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Available from SCS Available from SCS Not Available Not Available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Available from SCS Not Available Not Available Not Available
POST-CONSTRUCTION SURVEYS OF DAM	None performed
BORROW SOURCES	Local. Available from SCS

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	Report of grouting operation performed in 1966 available from Prepakt Concrete Co., 1405 Western Saving Fund Building, Philadelphia, Pa. 19107
HIGH FLOOD RECORDS	Not Recorded
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Available as noted above.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None
MAINTENANCE OPERATION RECORDS	None kept

x

<u>ITEM</u>	<u>REMARKS</u>
SPILLWAY PLAN	Plans, sections and details for principal and auxiliary spillways available from SCS.
SECTIONS	
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	Available from SCS.



August, 1980
View of Principal Spillway Intake Structure



August, 1980
View of Principal Spillway Outlet (8' Range Pole)



August, 1980
View of Auxiliary Spillway Channel



August, 1980
View of Downstream from Dam Crest



August, 1980
View of Downstream Face of Dam



August, 1980
View of Dam Crest Looking Southwest

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 0.64 sq. mi.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 99 * (50 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 102.2 (63 acre-feet)

ELEVATION MAXIMUM DESIGN POOL: Unknown

ELEVATION TOP DAM: 104 * (73.7 acre-feet)

CREST: _____

- a. Elevation 102.2 *
- b. Type Auxiliary Spillway Channel
- c. Width 30-foot-wide channel
- d. Length 300-foot-long channel
- e. Location Spillover Right abutment
- f. Number and Type of Gates None

OUTLET WORKS: Principal spillway (Crest El. - 99.0 *)

- a. Type Two-stage drop inlet with 66" dia. CMP
- b. Location Center of Dam
- c. Entrance inverts 81 *
- d. Exit inverts 80 *
- e. Emergency draindown facilities 15" dia. CMP inlet at invert 81.5 *

HYDROMETEOROLOGICAL GAGES: None

- a. Type _____
- b. Location _____
- c. Records _____

MAXIMUM NON-DAMAGING DISCHARGE: 1255 cfs

* Assumed datum

BY D. LANS DATE Sept. 20
CHKD. BY DATE
SUBJECT

LOUIS BERGER & ASSOCIATES INC.
J. SEWARD JOHNSON DAM

SHEET NO. A1 OF A12
PROJECT C26E

TIME OF CONCENTRATION:

A LENGTH ALONG WATERCOURSE TO DRAINAGE DIVIDE = 7000' = 1.61 mi.

$$\Delta H = 640 - 270 = 350'$$

$$\text{SLOPE} = \frac{350' \times 100}{7000} = 5.0\% \quad \text{ASSUME VELOCITY} = 3 \text{ FT/SEC.}$$

$$t_c = \frac{7000}{3 \times 3600} = 0.65 \text{ HOURS}$$

OVERLAND FLOW: $\Delta H = 720 - 640 = 80'/1500' = 5\%$ Assume $V=3/\text{sec.}$: $t_c = .14 \text{ HR.}$

$$t_c = .65 + .14 = 0.79 \text{ HRS}$$

B. By CALIFORNIA CULVERTS METHOD

$$t_c = \left(\frac{11.9 L^3}{H} \right)^{0.385} = \left(\frac{11.9 (1.61)^3}{430} \right)^{0.385} = 0.44 \text{ HOURS}$$

$$\text{TOTAL } t_c = .44 + .14 = .58 \text{ HR}$$

C. By SCS METHOD (FROM "URBAN HYDROLOGY FOR SMALL WATERSHEDS" TECHNICAL RELEASE NO. 55)

ASSUME CN FOR WATERSHED = 79

SLOPE = 5.0%

L = 8500'

$$S = \frac{1000}{CN} - 10 = 2.66$$

$$L = \text{LAG IN HOURS} = \frac{L^{0.8} (S+1)^{0.7}}{1900 \cdot (y)^{0.5}} = \frac{8500^{0.8} (2.66+1)^{0.7}}{1900 (5)^{0.5}} = 0.81 \text{ HOURS}$$

$$t_c = \frac{L}{0.6} = \frac{0.81}{0.6} = 1.35 \text{ HOURS}$$

USE $t_c = 0.91 \text{ HOURS}$

$$D = 6 \text{ min} = .1 \text{ HR}$$

$$T_p = \frac{D}{2} + 0.6 t_c = \frac{0.10}{2} + 0.6 (0.91) = 0.60$$

$$\text{LAG} = 0.6 t_c = .55 \text{ HRS.}$$

$$Q_p = \frac{4.54 (.64)}{0.60} = 516 \text{ cfs}$$

BY J. Berger DATE 3/17/71
CHKD. BY _____ DATE _____
SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

J. SEWARD JOHNSON DAM

SHEET NO. A2 OF A12
PROJECT C 362

Test Stream: 100 Year Freq.

Precipitation data from TP-40 & NOAA Technical
Memorandum NWS Hydro - 35

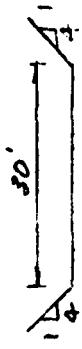
Time	Precip.	Δ	RD	Time	Precip.	Δ	RD
0.1	.91	.91	.03	3.1	4.30	.05	.91
0.2	1.46	.55	.03	3.2	4.34	.04	.35
0.3	1.81	.35	.03	3.3	4.38	.04	.23
0.4	2.07	.26	.03	3.4	4.41	.03	.17
0.5	2.30	.23	.02	3.5	4.45	.04	.12
0.6	2.46	.16	.03	3.6	4.48	.03	.10
0.7	2.63	.17	.02	3.7	4.52	.04	.09
0.8	2.77	.14	.04	3.8	4.56	.04	.08
0.9	2.89	.12	.03	3.9	4.60	.04	.07
1.0	3.00	.11	.03	4.0	4.63	.03	.06
1.1	3.10	.10	.03	4.1	4.66	.03	.06
1.2	3.20	.10	.04	4.2	4.69	.03	.05
1.3	3.29	.09	.03	4.3	4.72	.03	.05
1.4	3.36	.07	.03	4.4	4.75	.03	.05
1.5	3.44	.08	.04	4.5	4.78	.03	.04
1.6	3.51	.07	.04	4.6	4.82	.04	.05
1.7	3.58	.07	.05	4.7	4.85	.03	.04
1.8	3.65	.07	.05	4.8	4.87	.02	.04
1.9	3.71	.06	.05	4.9	4.90	.03	.04
2.0	3.76	.05	.05	5.0	4.93	.03	.04
2.1	3.82	.06	.05	5.1	4.96	.03	.03
2.2	3.87	.05	.07	5.2	4.98	.02	.03
2.3	3.92	.05	.07	5.3	5.01	.02	.03
2.4	3.97	.05	.07	5.4	5.04	.03	.03
2.5	4.02	.05	.10	5.5	5.06	.02	.03
2.6	4.07	.05	.11	5.6	5.09	.03	.03
2.7	4.12	.05	.14	5.7	5.12	.03	.03
2.8	4.17	.05	.16	5.8	5.15	.03	.02
2.9	4.21	.04	.26	5.9	5.17	.02	.03
3.0	4.25	.04	.55	6.0	5.20	.03	.02

BY D. LANE DATE SEPT. '80
 CHKD. BY DATE
 SUBJECT

LOUIS BERGER & ASSOCIATES INC.

J. SEVENHOE JOHNSON DAM
 SPURRAY DISCHARGE

SHEET NO. 43 OF A12
 PROJECT C-262



$$A = 23.76$$

$$EFFECTIVE = L = 2.0$$

OPEN CHANNEL

$$Q_p = C \cdot A \sqrt{2gH}$$

100' E

AUXILIARY VARIOUS

ELEV H C L Q_s H C Q_p H S S 1/2 A P R R^{1/2} R^{1/2} Q₁₀ Q₁₀₁

99.0	0	3.1	2.2	0	15.25	0.52	0								0
100	1			68.2	17.25										68.2
101	2			132.9	18.25										132.9
102	3			354.4	19.25										354.4
102.47	3.47			440.3	20.32										440.3
103	4			435	0	0.47									435
103.47	5			446.2	1	0.48									446.2
104				457.1	2										457.1
105				21.25											21.25
106				22.25											22.25
107															107

TOP OF DAM

106 107

105 106 107

104 105 106 107

103 104 105 106 107

102 103 104 105 106 107

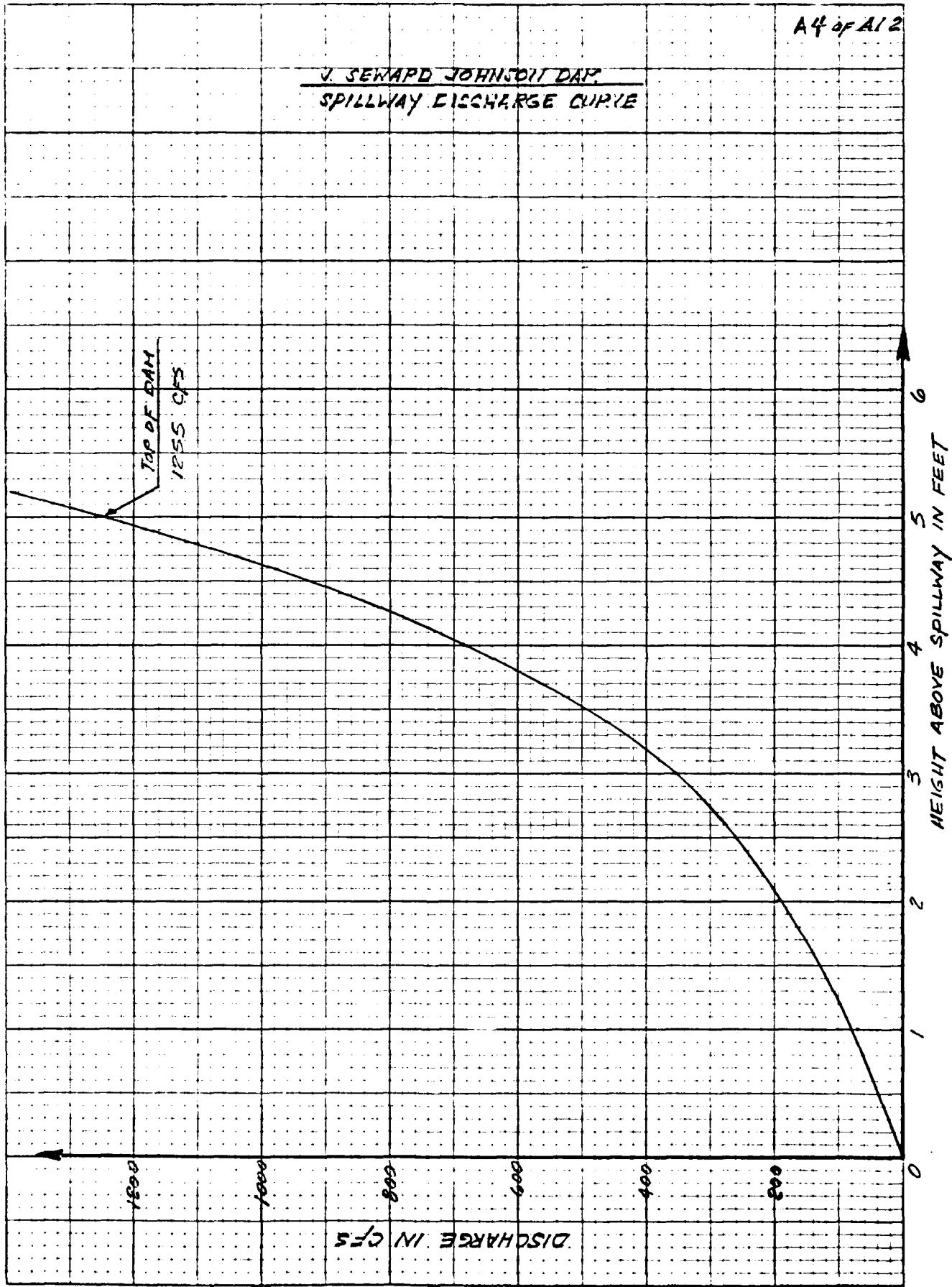
101 102 103 104 105 106 107

100 101 102 103 104 105 106 107

99.0 100 101 102 103 104 105 106 107

10 X 10 TO THE INCH • 10 INCHES
KENTFEL ASSOCIATES COMPANY INC.

46 0780

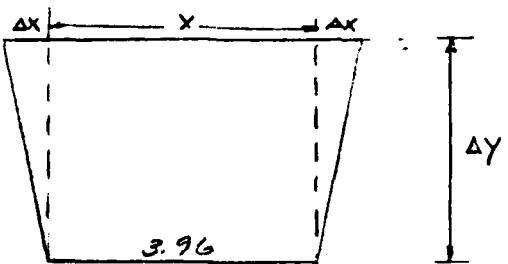


BY C. LUNG DATE SEPT. '70
CHKD. BY _____ DATE _____
SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.
J. SEWARD JOHNSON DAM
SURCHARGE STORAGE

SHEET NO. A5 OF A12
PROJECT C 262

AREA OF LAKE @ ELEV. 99.0 = 3.96 ACRES (SPILLWAY CREST)
AREA @ ELEV. 104.0 = 5.5 ACRES



HEIGHT ABOVE SPILLWAY CREST (FT.)	ELEV.	AREA (ACRES)	AREA OF SURFACE STORAGE (ACRES)
0	99	0	3.96
1	100	4.27	
2	101	4.58	
3	102	4.88	
4	103	5.19	
5	104	5.50	5.5

BY D. LANG DATE SEPT. '70
CHKD. BY _____ DATE _____
SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.
J. SWANKE JOHNSON DAM
DRAWDOWN CAPACITY

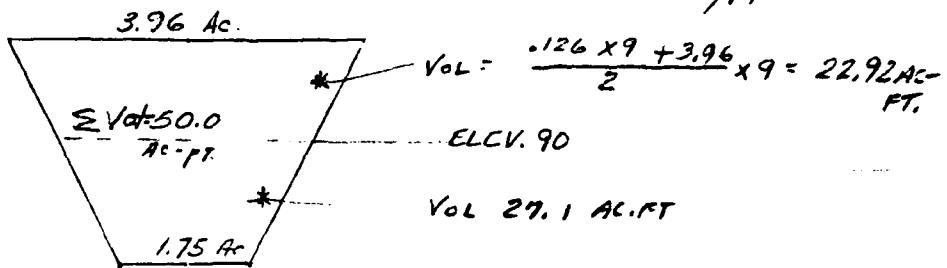
SHEET NO. A-6 OF A12
PROJECT C-262

DRAWDOWN CAPABILITIES ARE CONTROLLED BY 12"X12" GATE
LOCATED IN MAIN RISER FACE
INVERT ELEV. = 81.5
ASSUME INFLOW OF 1.0 CFS \approx 1 CFS / SQ. MI.

ELEV. 99.0

ELEV. 81.5

$$\Delta \text{Area} = 126 \text{ AC/FT}$$



$$Q = CA \sqrt{2gH}$$

$$C = 0.52$$

$$A = 1 \text{ FT}^2$$

FROM 99.0 TO 90.0 $H_{AVG} = 13.125' - .5' (\frac{1}{2} \text{ OF 12" GATE})$

$$Q = 0.52 \times 1 \times \sqrt{64.4 \times 12.625} \\ = 14.8 \text{ CFS} - 1 \text{ CFS}_{\text{inflow}} = 13.8 \text{ CFS}$$

$$\frac{22.7 \times 43560}{13.8 \times 3600} = 20.1 \text{ HOURS}$$

From 90.00 to 81.50 $H_{AVG} = \frac{8.5' - .5'}{2} (\frac{1}{2} \text{ OF 12" GATE})$

$$Q = 0.52 \times 1 \times \sqrt{64.4 \times 4} \\ = 8.34 \text{ CFS} - 1 \text{ say } 7.34 \text{ CFS}$$

$$\frac{27.1 \times 43560}{7.34 \times 3600} = 44.7 \text{ HOURS}$$

$$\text{TOTAL} = 20.1 + 44.7 = 64.8 \text{ HOURS} \approx 27 \text{ days}$$

BY T. LANG DATE 5/1/80
CHKD. BY J.C. DATE 5/17/80
SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

J. EDWARD JOHNSON, D.M.
SUMMARY OF HEC-1 INPUT DATA

SHEET NO. A7 OF A12
PROJECT C238

<u>HEIGHT ABOVE SPILLWAY (FT.)</u>	<u>ELEV. (FEET)</u>	<u>DISCHARGE (CFS)</u>	<u>AREA OF SURCHARGE STORAGE (ACRES)</u>
0	99	0	3.96
1	101	68.2	
2	102	192.9	
3	103	354.4	
4	104	684.1	
5	105	1255.4	5.5

BY Seaward DATE 4/7/81
CHKD. BY _____ DATE _____
SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

SHEET NO A8 OF A12
PROJECT C 262

A1 J SEWARD JOHNSON HEC10B
A2 J CERAVOLO
A3 MARCH 17, 1981
B 100 0 6 0 0 0 0 0 0 0 0
B1 5
J 1 1 1
J1 1
K 0 1 1
K1 INFLOW HYDROGRAPH TO RESERVOIR
M 0 2 64 0
O 60
01 03 03 03 03 02 03 02 04 03 03
01 03 04 03 03 04 04 05 05 05 05
01 05 07 07 07 10 11 14 16 26 55
01 91 35 23 17 12 10 09 08 07 08
01 06 05 05 05 04 05 04 04 04 04
01 03 03 03 03 03 03 03 02 03 02
T 5 1
W2 55
X 0 0 1
K 1 2 1
K1 ROUTED FLOWS THROUGH RESERVOIR
Y 1 1 -1
Y1
Y4 99 100 101 102 103 104
Y5 0 68.2 192.9 354.4 684.1 1255.4
\$A 3.96 5.50
\$E 99 104
\$\$ 99
\$D 104
K 99

JOB SPECIFICATION										
NG	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN	
100	0	6	0	0	0	0	0	0	0	
				JOPER	NWT	LROPT	TRACE			
				5	0	0	0			

INFLOW HYDROGRAPH TO RESERVOIR										
ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	I NAME	ISTAGE	IAUTO		
1	0	0	0	0	0	1	0	0		

HYDROGRAPH DATA										
IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL	
0	2	0.64	0.00	0.64	0.00	0.000	0	0	0	
PRECIP PATTERN										
0.03	0.03	0.03	0.03	0.02	0.03	0.02	0.04	0.03	0.03	
0.03	0.04	0.03	0.03	0.04	0.04	0.05	0.05	0.05	0.05	
0.05	0.07	0.07	0.07	0.10	0.11	0.14	0.16	0.26	0.55	
0.91	0.35	0.23	0.17	0.12	0.10	0.09	0.08	0.07	0.06	
0.06	0.05	0.05	0.05	0.04	0.05	0.04	0.04	0.04	0.04	
0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.02	

LOSS DATA										
LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	0.50	0.10	0.00	0.00

BY JK DATE 3/17/81
CHKD. BY _____ DATE _____
SUBJECT _____

LOUIS BERGER & ASSOCIATES INC.

SHEET NO 15 OF 15
PROJECT 15

UNIT HYDROGRAPH DATA

O	END-OF-PERIOD FLOW										COMP G									
	MO. DA	HR. MN	PERIOD	RAIN	EXCS	LOSS	COMP G	MO. DA	HR. MN	PERIOD	RAIN	EXCS	LOSS	COMP G	MO. DA	HR. MN	PERIOD	RAIN	EXCS	LOSS
1.01	0	06	1	0.03	0.00	0.03	0	1.01	1.01	5.06	5.51	0.03	0.02	0	1.01	1.01	5.12	5.52	0.03	0.02
1.01	0	12	2	0.03	0.00	0.03	0	1.01	1.01	5.12	5.53	0.03	0.02	0	1.01	1.01	5.18	5.53	0.03	0.02
1.01	0	18	3	0.03	0.00	0.03	0	1.01	1.01	5.18	5.54	0.03	0.02	0	1.01	1.01	5.24	5.54	0.03	0.02
1.01	0	24	4	0.03	0.00	0.03	0	1.01	1.01	5.24	5.59	0.03	0.02	0	1.01	1.01	5.30	5.59	0.03	0.02
1.01	0	30	5	0.02	0.00	0.02	0	1.01	1.01	5.30	5.55	0.03	0.02	0	1.01	1.01	5.36	5.56	0.03	0.02
1.01	0	36	6	0.03	0.00	0.03	0	1.01	1.01	5.36	5.57	0.03	0.02	0	1.01	1.01	5.42	5.57	0.03	0.02
1.01	0	42	7	0.02	0.03	0.02	0	1.01	1.01	5.42	5.63	0.03	0.02	0	1.01	1.01	5.48	5.63	0.03	0.02
1.01	0	48	8	0.04	0.00	0.04	0	1.01	1.01	5.48	5.64	0.03	0.02	0	1.01	1.01	5.54	5.64	0.03	0.02
1.01	0	54	9	0.03	0.00	0.03	0	1.01	1.01	5.54	5.65	0.03	0.02	0	1.01	1.01	5.60	5.65	0.03	0.02
1.01	1	00	10	0.03	0.00	0.03	0	1.01	1.01	6.00	6.00	0.00	0.00	0	1.01	1.01	6.06	6.00	0.00	0.00
1.01	1	06	11	0.03	0.00	0.03	0	1.01	1.01	6.06	6.06	0.00	0.00	0	1.01	1.01	6.12	6.06	0.00	0.00
1.01	1	12	12	0.04	0.00	0.04	0	1.01	1.01	6.12	6.16	0.00	0.00	0	1.01	1.01	6.18	6.16	0.00	0.00
1.01	1	18	13	0.03	0.00	0.03	0	1.01	1.01	6.18	6.32	0.00	0.00	0	1.01	1.01	6.24	6.32	0.00	0.00
1.01	1	24	14	0.03	0.00	0.03	0	1.01	1.01	6.24	6.59	0.00	0.00	0	1.01	1.01	6.30	6.59	0.00	0.00
1.01	1	30	15	0.04	0.00	0.04	0	1.01	1.01	6.30	6.65	0.00	0.00	0	1.01	1.01	6.36	6.65	0.00	0.00
1.01	1	36	16	0.04	0.00	0.04	0	1.01	1.01	6.36	6.66	0.00	0.00	0	1.01	1.01	6.42	6.66	0.00	0.00
1.01	1	42	17	0.05	0.04	0.01	2	1.01	1.01	6.42	6.77	0.00	0.00	0	1.01	1.01	6.48	6.77	0.00	0.00
1.01	1	48	18	0.05	0.04	0.01	6	1.01	1.01	6.48	6.88	0.00	0.00	0	1.01	1.01	6.54	6.88	0.00	0.00
1.01	1	54	19	0.05	0.04	0.01	16	1.01	1.01	6.54	6.97	0.00	0.00	0	1.01	1.01	6.70	6.97	0.00	0.00
1.01	2	00	20	0.05	0.04	0.01	32	1.01	1.01	7.00	7.00	0.00	0.00	0	1.01	1.01	7.06	7.00	0.00	0.00
1.01	2	06	21	0.05	0.04	0.01	51	1.01	1.01	7.12	7.22	0.00	0.00	0	1.01	1.01	7.18	7.22	0.00	0.00
1.01	2	12	22	0.07	0.06	0.01	73	1.01	1.01	7.22	7.30	0.00	0.00	0	1.01	1.01	7.24	7.30	0.00	0.00
1.01	2	18	23	0.07	0.05	0.01	95	1.01	1.01	7.30	7.36	0.00	0.00	0	1.01	1.01	7.36	7.36	0.00	0.00
1.01	2	24	24	0.07	0.06	0.01	117	1.01	1.01	7.36	7.40	0.00	0.00	0	1.01	1.01	7.40	7.40	0.00	0.00
1.01	2	30	25	0.10	0.09	0.01	140	1.01	1.01	7.40	7.50	0.00	0.00	0	1.01	1.01	7.50	7.50	0.00	0.00
1.01	2	36	25	0.11	0.12	0.01	164	1.01	1.01	7.50	7.68	0.00	0.00	0	1.01	1.01	7.56	7.68	0.00	0.00
1.01	2	42	27	0.14	0.13	0.01	191	1.01	1.01	7.56	7.77	0.00	0.00	0	1.01	1.01	7.62	7.77	0.00	0.00
1.01	2	48	28	0.16	0.15	0.01	226	1.01	1.01	7.62	7.83	0.00	0.00	0	1.01	1.01	7.68	7.83	0.00	0.00
1.01	3	04	29	0.26	0.25	0.01	271	1.01	1.01	7.74	7.97	0.00	0.00	0	1.01	1.01	7.80	7.97	0.00	0.00
1.01	3	10	30	0.55	0.54	0.01	342	1.01	1.01	8.00	8.50	0.00	0.00	0	1.01	1.01	8.06	8.50	0.00	0.00
1.01	3	06	31	0.91	0.90	0.01	465	1.01	1.01	8.06	8.81	0.00	0.00	0	1.01	1.01	8.12	8.81	0.00	0.00
1.01	3	12	32	0.35	0.34	0.01	644	1.01	1.01	8.12	8.63	0.00	0.00	0	1.01	1.01	8.18	8.63	0.00	0.00
1.01	3	18	33	0.23	0.22	0.01	868	1.01	1.01	8.18	8.83	0.00	0.00	0	1.01	1.01	8.24	8.83	0.00	0.00
1.01	3	24	34	0.17	0.16	0.01	1017	1.01	1.01	8.24	8.94	0.00	0.00	0	1.01	1.01	8.30	8.94	0.00	0.00
1.01	3	30	35	0.12	0.11	0.01	1234	1.01	1.01	8.30	8.65	0.00	0.00	0	1.01	1.01	8.35	8.65	0.00	0.00
1.01	3	36	36	0.10	0.09	0.01	1284	1.01	1.01	8.35	8.86	0.00	0.00	0	1.01	1.01	8.42	8.86	0.00	0.00
1.01	3	42	37	0.09	0.08	0.01	1251	1.01	1.01	8.42	8.87	0.00	0.00	0	1.01	1.01	8.48	8.87	0.00	0.00
1.01	3	48	38	0.08	0.07	0.01	1154	1.01	1.01	8.48	8.83	0.00	0.00	0	1.01	1.01	8.54	8.83	0.00	0.00
1.01	3	54	39	0.07	0.06	0.01	1017	1.01	1.01	8.54	8.97	0.00	0.00	0	1.01	1.01	8.60	8.97	0.00	0.00
1.01	4	00	40	0.06	0.05	0.01	865	1.01	1.01	8.60	9.00	0.00	0.00	0	1.01	1.01	8.65	9.00	0.00	0.00
1.01	4	06	41	0.06	0.05	0.01	342	1.01	1.01	8.65	9.25	0.00	0.00	0	1.01	1.01	8.70	9.25	0.00	0.00
1.01	4	12	42	0.05	0.04	0.01	626	1.01	1.01	8.70	9.36	0.00	0.00	0	1.01	1.01	8.76	9.36	0.00	0.00
1.01	4	18	43	0.05	0.04	0.01	507	1.01	1.01	8.76	9.42	0.00	0.00	0	1.01	1.01	8.82	9.42	0.00	0.00
1.01	4	24	44	0.05	0.04	0.01	466	1.01	1.01	8.82	9.44	0.00	0.00	0	1.01	1.01	8.88	9.44	0.00	0.00
1.01	4	30	45	0.04	0.03	0.01	397	1.01	1.01	8.88	9.50	0.00	0.00	0	1.01	1.01	8.94	9.50	0.00	0.00
1.01	4	36	46	0.05	0.04	0.01	345	1.01	1.01	8.94	9.56	0.00	0.00	0	1.01	1.01	9.00	9.56	0.00	0.00
1.01	4	42	47	0.05	0.04	0.01	302	1.01	1.01	9.00	9.62	0.00	0.00	0	1.01	1.01	9.06	9.62	0.00	0.00
1.01	4	48	48	0.04	0.03	0.01	276	1.01	1.01	9.06	9.68	0.00	0.00	0	1.01	1.01	9.12	9.68	0.00	0.00
1.01	4	54	47	0.04	0.03	0.01	238	1.01	1.01	9.12	9.74	0.00	0.00	0	1.01	1.01	9.18	9.74	0.00	0.00
1.01	5	00	50	0.04	0.03	0.01	214	1.01	1.01	9.18	9.77	0.00	0.00	0	1.01	1.01	9.54	9.77	0.00	0.00

SUM (5.20 (4.26 (0.44 (17585
 (132)(108)(24)(497.05)

BY 1/17/61 DATE 3/17/61
CHKD. BY 1/17/61 DATE 3/17/61
SUBJECT HEGEL OF C47841

LOUIS BERGER & ASSOCIATES INC.

SHEET NO 4 OF 12
PROJECT C47841

HYDROGRAPH AT STA				1 FOR PLAN 1, RTIO 1			
CFS	1284	293	176	176		17585	
CMS	35	8	5	5		498	
INCHES		4.26	4.26	4.26		4.26	
MM		108.16	108.20	108.20		108.20	
AC-FT		145	145	145		145	
THOUS CU M		179	179	179		179	

ROUTED FLOWS THROUGH RESERVOIR

	ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	I NAME	I STAGE	I AUTO
	2	1	0	0	0	0	0	1	0
ROUTING DATA									
	GLOSS	CLOSS	Avg	IRES	ISAME	IOPT	IPMP	LSTR	
	0.0	0.000	0.00	1	1	0	0	0	
STAGE	99.00	100.00	101.00	102.00	103.00	104.00			
FLOW	0.00	68.20	192.90	354.40	684.10	1255.40			

SURFACE AREA= 4 6

CAPACITY= 0 24

ELEVATION= 99 104

CREL	SPWID	COQW	EXPW	ELEV	CUGL	CAREA	EXPL
99.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COGD	EXPD	DAMWID
104.0	0.0	0.0	0.

STATION 2, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES									
MO	DA	HR	MN	PERIOD	HOURS	INFLOW	OUTFLOW	STORAGE	STAGE
1	01	0	06		1	0.10	0.	0.	99.0
1	01	0	12		2	0.20	0.	0.	99.0
1	01	0	18		3	0.30	0.	0.	99.0
1	01	0	24		4	0.40	0.	0.	99.0
1	01	0	30		5	0.50	0.	0.	99.0
1	01	0	36		6	0.60	0.	0.	99.0
1	01	0	42		7	0.70	0.	0.	99.0
1	01	0	48		8	0.80	0.	0.	99.0
1	01	0	54		9	0.90	0.	0.	99.0
1	01	1	00		10	1.00	0.	0.	99.0
1	01	1	06		11	1.10	0.	0.	99.0
1	01	1	12		12	1.20	0.	0.	99.0
1	01	1	18		13	1.30	0.	0.	99.0
1	01	1	24		14	1.40	0.	0.	99.0
1	01	1	30		15	1.50	0.	0.	99.0
1	01	1	36		16	1.60	0.	0.	99.0
1	01	1	42		17	1.70	2	0.	99.0
1	01	1	48		18	1.80	6	1.	99.0
1	01	1	54		19	1.90	16	2	99.0
1	01	2	00		20	2.00	32	5	99.1
1	01	2	06		21	2.10	51	10	99.1
1	01	2	12		22	2.20	73	17	99.2
1	01	2	18		23	2.30	95	25	99.4
1	01	2	24		24	2.40	117	36	99.5
1	01	2	30		25	2.50	140	48	99.7
1	01	2	36		26	2.60	164	61	99.9
1	01	2	42		27	2.70	191	80	100.1
1	01	2	48		28	2.80	226	108	100.3
1	01	2	54		29	2.90	271	137	100.6
1	01	3	00		30	3.00	342	172	100.8
1	01	3	06		31	3.10	465	226	101.2
1	01	3	12		32	3.20	644	308	101.7
1	01	3	18		33	3.30	868	466	102.3
1	01	3	24		34	3.40	1088	683	103.0
1	01	3	30		35	3.50	1234	979	103.5
1	01	3	36		36	3.60	1264	1150	103.8
1	01	3	42		37	3.70	1251	1221	103.9
1	01	3	48		38	3.80	1154	1210	103.9
1	01	3	54		39	3.90	1017	1135	103.9
1	01	4	00		40	4.00	845	1017	103.6

BY LC DATE 3/17/61
CHKD. BY DATE
SUBJECT 1. Seepage Line

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A11 OF 112
PROJECT C 262

HSS 1.02 Cutpt

1.01	4.06	41	4.10	735.	884.	20.	103.3
1.01	4.12	42	4.20	626.	758.	19.	103.1
1.01	4.18	43	4.30	537.	660.	18.	102.9
1.01	4.24	44	4.40	461.	592.	17.	102.7
1.01	4.30	45	4.50	397.	523.	16.	102.5
1.01	4.36	46	4.60	345.	458.	15.	102.3
1.01	4.42	47	4.70	302.	399.	14.	102.1
1.01	4.48	48	4.80	266.	351.	13.	102.0
1.01	4.54	49	4.90	238.	327.	12.	101.8
1.01	5.00	50	5.00	214.	302.	12.	101.7
1.01	5.06	51	5.10	194.	278.	11.	101.5
1.01	5.12	52	5.20	177.	255.	10.	101.4
1.01	5.18	53	5.30	162.	234.	10.	101.3
1.01	5.24	54	5.40	147.	214.	9.	101.1
1.01	5.30	55	5.50	136.	196.	9.	101.0
1.01	5.36	56	5.60	125.	182.	8.	100.9
1.01	5.42	57	5.70	115.	169.	8.	100.8
1.01	5.48	58	5.80	106.	157.	7.	100.7
1.01	5.54	59	5.90	99.	146.	7.	100.6
1.01	6.00	60	6.00	92.	135.	6.	100.5
1.01	6.06	61	6.10	86.	126.	6.	100.5
1.01	6.12	62	6.20	79.	116.	6.	100.4
1.01	6.18	63	6.30	71.	108.	5.	100.3
1.01	6.24	64	6.40	61.	99.	5.	100.2
1.01	6.30	65	6.50	50.	89.	5.	100.2
1.01	6.36	66	6.60	40.	80.	5.	100.1
1.01	6.42	67	6.70	31.	70.	4.	100.0
1.01	6.48	68	6.80	24.	64.	4.	99.9
1.01	6.54	69	6.90	18.	59.	4.	99.9
1.01	7.00	70	7.00	14.	53.	3.	99.8
1.01	7.06	71	7.10	10.	48.	3.	99.7
1.01	7.12	72	7.20	8.	43.	3.	99.6
1.01	7.18	73	7.30	6.	39.	2.	99.6
1.01	7.24	74	7.40	4.	34.	2.	99.5
1.01	7.30	75	7.50	3.	30.	2.	99.4
1.01	7.36	76	7.60	3.	27.	2.	99.4
1.01	7.42	77	7.70	2.	24.	1.	99.3
1.01	7.48	78	7.80	1.	21.	1.	99.3
1.01	7.54	79	7.90	1.	18.	1.	99.3
1.01	8.00	80	8.00	1.	16.	1.	99.2
1.01	8.06	81	8.10	1.	14.	1.	99.2
1.01	8.12	82	8.20	0.	12.	1.	99.2
1.01	8.18	83	8.30	0.	11.	1.	99.2
1.01	8.24	84	8.40	0.	9.	1.	99.1
1.01	8.30	85	8.50	0.	8.	0.	99.1
1.01	8.36	86	8.60	0.	7.	0.	99.1
1.01	8.42	87	8.70	0.	6.	0.	99.1
1.01	8.48	88	8.80	0.	5.	0.	99.1
1.01	8.54	89	8.90	0.	5.	0.	99.1
1.01	9.00	90	9.00	0.	4.	0.	99.1
1.01	9.06	91	9.10	0.	3.	0.	99.1
1.01	9.12	92	9.20	0.	3.	0.	99.0
1.01	9.18	93	9.30	0.	3.	0.	99.0
1.01	9.24	94	9.40	0.	2.	0.	99.0
1.01	9.30	95	9.50	0.	2.	0.	99.0
1.01	9.36	96	9.60	0.	2.	0.	99.0
1.01	9.42	97	9.70	0.	1.	0.	99.0
1.01	9.48	98	9.80	0.	1.	0.	99.0
1.01	9.54	99	9.90	0.	1.	0.	99.0
1.01	10.00	100	10.00	0.	1.	0.	99.0

PEAK OUTFLOW IS

1221. AT TIME 3.70 HOURS

CFS	1221.	291.	176.	176.	17580.
CMS	35.	8.	5.	5.	498.
INCHES		4.23	4.26	4.26	4.26
MM		107.52	108.17	108.17	108.17
AC-FT		144.	145.	145.	145.
THOUS CU M		178.	179.	179.	179.

BY J.C. DATE 3/17/81
CHKD. BY J. Sauer-Johnson DATE
SUBJECT HEC-1 PT. EX-1001

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. 112 OF 112
PROJECT C-262

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS	
				RATIO	1
				1.00	
HYDROGRAPH AT	1	0.64	1	1284.	
		(1.66)		(36.36)	
ROUTED TO	2	0.64	1	1221.	
		(1.66)		(34.57)	

SUMMARY OF DAM SAFETY ANALYSIS

	INITIAL	VALUE	SPILLWAY	CREST	TOP OF DAM
ELEVATION		99.00		99.00	104.00
STORAGE		0.		0.	24.
OUTFLOW		0.		0.	1255.

RATIO	MAXIMUM	MAXIMUM	MAXIMUM	MAXIMUM	DURATION	TIME OF	TIME OF
OF	RESERVOIR	DEPTH	STORAGE	OUTFLOW	OVER TOP	MAX OUTFLOW	FAILURE
PMF	W. S. ELEV	OVER DAM	AC-FT	CFS	HOURS	HOURS	HOURS
1.00	103.94	0.00	23.	1221.	0.00	3.70	0.00

